



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/849,537

05/07/2001

Tonglong Zhang

1875.0370000

7984

7590

12/22/2004

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Suite 600

1100 New York Avenue, N. W.

Washington, DC 20005-3934

EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 12/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/849,537

Applicant(s)

ZHANG ET AL

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 October 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3,4,6,7,9,10,12,13,16,17,38-65 and 68-70 is/are pending in the application.
- 4a) Of the above claim(s) 3,4,6,7,9,10,12,38-51,60-65 and 68 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 13,16,17, 52-59, 69 and 70 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>10/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to the amendment filed October 28, 2004.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 13, 16, 17, 52-59 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Culnane et al. (U.S. Patent No. 5,744,863) in view of Jamieson et al. (U.S. Patent No. 6,545,351).

In regards to claim 13, Culnane et al. ("Culnane") discloses the following:

- a) a substrate (256) having a plurality of contact pads (254) on a first surface electrically connected through said substrate to a plurality of solder balls (259) on a second surface of said substrate (For Example: See Figure 5);
- b) an integrated circuit die (252) that is mounted to said first surface of said substrate (For Example: See Figure 5);
- c) a ring shaped stiffener (262) being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate (For Example: See Figure 5); and
- d) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump (258) on an active surface of said IC die is connected to said first surface of said substrate (For Example: See Figure 5).

In regards to claim 13, Culnane fails to disclose the following:

- a) a heat spreader that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate and wherein the second surface of said heat spreader is capable of being coupled to a printed circuit board.

Art Unit: 2822

However, Jamieson discloses a semiconductor device with a heat spreader (30) (For Example: See Figure 4 and Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include a heat spreader as disclosed in Jamieson because it aids in reducing thermal impedance (For Example: See Abstract).

Additionally, since Culnane and Jamieson are both from the same field of endeavor (semiconductors), the purpose disclosed by Jamieson would have been recognized in the pertinent art of Culnane.

In regards to claim 16, Culnane discloses the following:

a) a second heat spreader (270) attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener (For Example: See Figure 5).

In regards to claim 17, Culnane fails to disclose the following:

a) a via located proximate to said mounted IC die that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader.

However, Jamieson discloses a semiconductor device with vias (For Example: See Column 2 Lines 26-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include vias as disclosed in Jamieson because it aids in providing an electrical connection (For Example: See Column 2 Lines 26-28).

Additionally, since Culnane and Jamieson are both from the same field of endeavor (semiconductors), the purpose disclosed by Jamieson would have been recognized in the pertinent art of Culnane.

Art Unit: 2822

In regards to claim 52, Culnane discloses the following:

a) second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive (272) material (For Example: See Figure 5).

In regards to claim 53, Culnane discloses the following:

a) second heat spreader is attached to said nonactive surface of said IC die with a thermally conductive adhesive material (274) (For Example: See Figure 5).

In regards to claim 54, Culnane discloses the following:

a) heat spreader comprises at least one metal (For Example: See Column 5 Lines 20-22).

In regards to claim 55, Culnane discloses the following:

a) at least one metal includes copper (For Example: See Column 5 Lines 20-22).

In regards to claim 56, Culnane discloses the following:

a) at least one metal includes aluminum (For Example: See Column 5 Lines 20-22).

In regards to claim 57, Culnane discloses the following:

a) second heat spreader is substantially planar (For Example: See Figure 5).

In regards to claim 58, Culnane fails to disclose the following:

a) conductive material filling said via thermally couples said conductive bump to said heat spreader.

However, Jamieson discloses a semiconductor device with vias (For Example: See Column 2 Lines 26-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include vias as disclosed in Jamieson because it aids in providing an electrical connection (For Example: See Column 2 Lines 26-28).

Art Unit: 2822

Additionally, since Culnane and Jamieson are both from the same field of endeavor (semiconductors), the purpose disclosed by Jamieson would have been recognized in the pertinent art of Culnane.

In regards to claim 59, Jamieson fails to disclose the following:

a) conductive material filling said via electrically couples said conductive bump to said heat spreader.

However, Jamieson discloses a semiconductor device with vias (For Example: See Column 2 Lines 26-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include vias as disclosed in Jamieson because it aids in providing an electrical connection (For Example: See Column 2 Lines 26-28).

Additionally, since Culnane and Jamieson are both from the same field of endeavor (semiconductors), the purpose disclosed by Jamieson would have been recognized in the pertinent art of Culnane.

In regards to claim 70, Culnane fails to disclose the following:

a) heat surface has solder that allows the second surface of the heat spreader to be surface mounted to soldering pads on the PCB.

However, Jamieson discloses that the heat spreader has solder (For Example: See Column 2 Lines 47 and 48). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include a heat spreader with solder as disclosed in Jamieson because it aids in providing a means to attach to the PCB (For Example: See Column 2 Lines 47 and 48).

Art Unit: 2822

Additionally, since Culnane and Jamieson are both from the same field of endeavor (semiconductors), the purpose disclosed by Jamieson would have been recognized in the pertinent art of Culnane.

Finally, the following limitation makes it a product by process claim: a) "plated with solder." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

Art Unit: 2822

4. Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Culnane et al. (U.S. Patent No. 5,744,863) in view of Jamieson et al. (U.S. Patent No. 6,545,351) and Chen et al. (U.S. Patent No. 5,903,052).

In regards to claim 69, Culnane fails to disclose the following:

a) an outer profile of the heat spreader overlaps with an inner profile of the ring shaped stiffener.

However, Chen discloses that an outer profile of the heat spreader (16) overlaps with an inner profile of the ring shaped stiffener (12a) (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include an outer profile of the heat spreader that overlaps with an inner profile of the ring shaped stiffener as disclosed in Chen because it aids in providing the device with good efficiency (For Example: See Column 2 Lines 8 and 9).

Additionally, since Culnane and Chen are both from the same field of endeavor (semiconductors), the purpose disclosed by Chen would have been recognized in the pertinent art of Culnane.

Response to Arguments

5. Applicant's arguments filed 10/28/04 have been fully considered but they are not persuasive. Applicant argues that "package 10 in Jamieson includes an exposed conductive layer 26 directly attached to the integrated circuit 12 and to the heat slug 30...the inclusion of the exposed conductive layer 26 between the integrated circuit 12 and the heat slug 30, as shown in Jamieson, precludes routing between the copper pads 254 and 260 of Culnane. If copper pads 254 and 260 are not connected, then signals at pads 254 cannot be provided to the substrate 280, for example. Thus, the TBGA module of Culnane would not operate, and would be

Art Unit: 2822

unsatisfactory for its intended purpose.” However, Jamieson discloses that vias may be formed in the substrate to electrically connect the integrated circuit to the solder balls (For Example: See Column 2 Lines 16-29). Therefore, it appears that routing would not be precluded and that the module of Culnane would operate because there would be an electrical connection.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final

Art Unit: 2822

communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML

December 17, 2004

A handwritten signature in black ink, consisting of a large, stylized 'M' followed by a horizontal line.

Mary Wilczewski
Primary Examiner